first grating frequency and a second grating vector non-parallel to the first grating vector, where the second hologram is configured to diffract at least some of the light coupled into the grating medium in the given direction, and a third hologram overlapping the first and second holograms in the grating medium and having a third grating frequency that is different from the first and second grating frequencies and a third grating vector non-parallel to the first and second grating vectors, where the third hologram is configured to diffract at least some of the light coupled into the grating medium in the given direction.

[0100] In accordance with any combination of the above embodiments, the given direction is orthogonal to a lateral surface of the grating medium.

[0101] In accordance with any combination of the above embodiments, the optical system further includes optical structures configured to provide the light to an input face of the prism at an angle perpendicular to the input face.

[0102] In accordance with any combination of the above embodiments, the prism includes a first wedge and a second wedge on the first wedge, where the second wedge includes the input face, the first wedge has a first Abbe number, and the second wedge has a second Abbe number that is different than the first Abbe number.

[0103] In accordance with any combination of the above embodiments, the prism has a first Abbe number and the grating medium has a second Abbe number that is within 30 of the first Abbe number.

[0104] In accordance with any combination of the above embodiments, the grating medium is embedded in a waveguide and the prism is mounted to a surface of the waveguide.

[0105] In accordance with any combination of the above embodiments, the waveguide includes a substrate having a first Abbe number and the grating medium has a second Abbe number that is different than the first Abbe number.

[0106] In accordance with any combination of the above embodiments, the prism includes titanate.

[0107] In accordance with another embodiment, a head-mounted display device is provided that includes first and second substrates, a grating medium between the first and second substrates, a prism on the first substrate and configured to couple light into the grating medium through the first substrate, and a holographic optical element in the grating medium and configured to diffract the light coupled into the grating medium, where the prism includes a first portion on a surface of the first substrate that has a first Abbe number, and a second portion on the first portion that has a second Abbe number that is different than the first Abbe number.

[0108] In accordance with any combination of the above embodiments, the second portion includes an input face that is configured to receive the light, where the second portion is configured to convey the light to the grating medium through the first portion, the first portion has an upper surface that contacts the second portion, the upper surface is oriented at a first angle with respect to a bottom surface of the prism, and the input face is oriented at a second angle that is greater than the first angle with respect to the bottom surface of the prism.

[0109] The foregoing is merely illustrative and various modifications can be made to the described embodiments. The foregoing embodiments may be implemented individually or in any combination.

What is claimed is:

1. An optical system comprising:

a waveguide having first and second waveguide substrates and a grating medium between the first and second waveguide substrates;

a prism on the first waveguide substrate and configured to couple light into the grating medium through the first waveguide substrate, wherein the prism comprises:

a first wedge on a surface of the first waveguide substrate, the first wedge having a first index of refraction,

a second wedge on a surface of the first wedge, the second wedge having a second index of refraction that is different from the first index of refraction, and

a third wedge on a surface of the second wedge, the third wedge having a third index of refraction that is different from the second index of refraction; and

a holographic optical element in the grating medium and configured to diffract, out of the waveguide, the light coupled into the grating medium by the prism.

2. The optical system of claim **1**, wherein the third wedge comprises an input face that is configured to receive the light, wherein the third wedge is configured to convey the light to the grating medium through the second and first wedges, the surface of the first wedge contacts the second wedge, the surface of the second wedge contacts the third wedge, the surface of the first wedge is oriented at a first angle with respect to a bottom surface of the prism, the surface of the second wedge is oriented at a second angle that is greater than the first angle with respect to the bottom surface of the prism, and the input face is oriented at a third angle that is greater than the second angle with respect to the bottom surface of the prism.

3. The optical system of claim **2**, wherein the surface of the first waveguide substrate has a first normal axis, wherein the surface of the first wedge has a second normal axis, wherein the second normal axis is oriented at a first non-zero angle with respect to the first normal axis within a first plane, and wherein the second normal axis is oriented at a second non-zero angle with respect to the first normal axis within a second plane, the first plane being perpendicular to the second plane.

4. The optical system of claim **3**, wherein the surface of the first wedge is curved.

5. The optical system of claim **4**, wherein the surface of the second wedge is curved.

6. The optical system of claim **3**, wherein the surface of the second wedge is curved.

7. The optical system of claim **3**, wherein the surface of the second wedge has a third normal axis, wherein the third normal axis is oriented at a third non-zero angle with respect to the first normal axis within the first plane, and wherein the third normal axis is oriented at a fourth non-zero angle with respect to the first normal axis within the second plane.

8. The optical system of claim **7**, wherein the surface of the first wedge is curved.

9. The optical system of claim **8**, wherein the surface of the second wedge is curved.

10. The optical system of claim **7**, wherein the surface of the second wedge is curved.

11. The optical system of claim **1**, wherein the third index of refraction is different from the first index of refraction.